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MULTILATERAL REFERENCE POINT

CROSS REFERENCE TO RELATED APPLICATIONS

[001] This application claims the benefit of an earlier filing date from U.S. Serial Number 60/216,807, filed July 7, 2000, the entire contents of which is incorporated herein by reference.

BACKGROUND

[002] In existing oil and gas wells where a multilateral junction is employed to effect lateral drilling into oil and gas formations not accessed by the primary wellbore, re-entry can be a difficult proposition. Several tools currently exist for locating a window for re-entry but each has disadvantages in either operation or cost.

SUMMARY

[003] A multilateral reference point sleeve and a method for orienting a tool in a wellbore to facilitate the installation of a multilateral junction or re-entry to a lateral borehole are disclosed. An advantage to the disclosed device and method is that the sleeve of the device has a relatively thin wall thickness, which allows for a minimum amount of reduction in cross sectional area of the wellbore in the vicinity of the installed device. The device comprises a sleeve configured to be received in a casing of a wellbore. The sleeve has an uphole end and a downhole end. The uphole end includes an edge that defines an orientation profile.

[004] At the downhole most section of the orientation profile, an orientation slot extends therefrom in a downhole direction. The orientation slot is configured to receive a pin on a tool run in the hole to engage the device causing the tool to orient to a particular direction as calculated by the placement of the pin at the surface.

[005] The sleeve is anchorable within the casing through the radial expansion of the downhole end of the sleeve against an inner surface of the casing. In one embodiment, the wall thickness of the sleeve proximate the downhole end of thereof is reduced as compared to the thickness of the wall proximate the uphole end of the

sleeve resulting in easier expansion of the sleeve by methods such as swaging and inflatables which do not require specific discussion.

[006] The method for orienting a tool in the wellbore includes running the multilateral reference point sleeve in the hole, anchoring the sleeve to the inner surface of the casing, and running a tool into the sleeve. Once the tool engages the sleeve, a pin on the tool engages the orientation profile and causes the rotation of the tool. Rotation stops when the pin drops into the slot. When properly oriented, the pin drops into the orientation slot, thereby causing the tool to maintain its proper orientation, which allows for control over direction for lateral drilling.

BRIEF DESCRIPTION OF THE DRAWINGS

[007] Figure 1 is a perspective view of a multilateral reference point device.

[008] Figure 2 is a side sectional view of the multilateral reference point device.

[009] Figure 3 is a side sectional view of an orientation profile of the multilateral reference point device.

[0010] Figure 4 is a side sectional view of the multilateral reference point device positioned within a tubing string in a wellbore prior to the device being expanded to be anchored in place.

[0011] Figure 5 is a side sectional view of the multilateral reference point device positioned within the casing in the wellbore and expanded to be anchored in place.

DETAILED DESCRIPTION

[0012] The multilateral reference point sleeve is a tubular member that is positionable within the casing of a wellbore to define a reference point for the installation of a multilateral junction or to facilitate re-entry to a lateral borehole at a later operation. The sleeve has an orientation profile along an uphole edge and an orientation slot cut or formed therein to lock a tool into its proper orientation, thereby ensuring proper rotational alignment of the tool with respect to the wellbore.

[0013] Referring to Figure 1, a multilateral reference point sleeve is shown generally at 10 and is hereinafter referred to as "sleeve 10". Sleeve 10 comprises a tubular member 12 having an uphole end 14 and a downhole end 16. Uphole end 14 is configured to have an orientation slot 18 cut or formed therein extending from an

orientation profile, shown generally at 20, which is defined by an upper edge 22 of tubular member 12.

[0014] Tubular member 12 is of a cross sectional shape that substantially conforms to the cross sectional shape of the casing of a wellbore (shown below with reference to Figures 3 and 4). In one embodiment the cross sectional shape is circular, although an elliptical or other shape may be used to define the cross section of the wellbore. A wall 24 of tubular member 12 is of a thickness that allows for a minimum amount of reduction in cross sectional area of the casing into which sleeve 10 is inserted while still enabling a tool to be properly oriented within the casing.

[0015] Referring now to Figure 2, downhole end 16 of tubular member 12 terminates in a lower edge 26. Wall 24 proximate lower edge 26 is configured to facilitate the anchoring of sleeve 10 into place within the casing. The anchoring of sleeve 10 is facilitated by the radial expansion of lower edge 26 of tubular member 12. In one embodiment, wall 24 proximate lower edge 26 has a thickness L_L that is significantly less than a thickness L_U of wall 24 proximate upper edge 22. The reduced thickness of the downhole end of the tubular member facilitates easier expansion thereof for retention within the wellbore.

[0016] Uphole end 14 of tubular member 12 is configured to form an angle 28 relative to the surface of wall 24. Therefore, the overall length of sleeve 10 from uphole end 14 to downhole end 16 is variable and has a value dependent upon the point on wall 24 at which the length is measured. Angle 28 defines orientation profile 20 of sleeve 10 having thickness L_U. Angle 28 may be of any common orientation profile angle known to the art. Referring to Figure 3, orientation profile 20 of the sleeve comprises a surface 29 that is perpendicularly situated with respect to wall 24. In a preferred embodiment, a width W of surface 29 of orientation profile 20 is maximized by minimizing the radius of edges 30 at which surface 29 and wall 24 meet.

[0017] Referring back to Figures 1 and 2, orientation slot 18 is formed or cut into sleeve 10 at a point that coincides with the most downhole point of orientation profile 20. Upon installation of the sleeve, care is taken to orient the slot in the desired direction. Orientation slot 18 extends perpendicularly from orientation profile 20 along the length of tubular member 12 for a distance D. Orientation slot 18 is

dimensioned and configured to receive a pin (not shown) on a tool being run to engage the device and orientate the tool.

[0018] It should be appreciated that the reference point disclosed may be installed before or after the creation of a multilateral junction. Where such is installed before the junction, it may be used to assist in locating tools to create the junction. In the event it is installed after the completion of the junction it is useful in assisting re-entry operations.

[0019] Referring now to Figure 4, the method of using sleeve 10 to orient the tool in a casing 36 of a wellbore, shown generally at 38, is illustrated. The method entails running sleeve 10 with orientation profile 20 in the uphole position into the existing casing 36. In running sleeve 10 into casing 36, care should be taken to ensure that sleeve 10 is properly positioned at the desired reference point.

[0020] Referring to Figure 5, sleeve 10 is shown anchored into position. When sleeve 10 is in its proper position within casing 36, lower edge 26 is expanded radially against an inner surface 33 of casing 36, thereby securing sleeve 10 into place within casing 36. Because of the reduced thickness of wall 24 proximate lower edge 26 of tubular member 12, a minimum amount of effort is required to expand lower edge 26 to anchor sleeve 10. In one application, lower edge 26 is expanded using an inflatable or mechanically expandable packer (not shown).

[0021] As a pin located on the tool engages orientation profile 20, the pin follows along orientation profile 20 until it reaches the most downhole point of orientation profile 20 where it moves into orientation slot 18. As the pin follows orientation profile 20, the tool to which the pin is connected rotates and is oriented within sleeve 10 and is properly situated for the desired operation. The exact rotational position of sleeve 10 can be determined using standard tools and methods either before installing sleeve 10 at the proper depth in casing 36 or thereafter.

[0022] If desired in some applications, a collet groove (not shown) may be added to tubular member 12 for use in securing tools to the sleeve. A collet mechanism on the tool can be used to secure the tool in the sleeve 10.

[0023] From this position, sleeve 10 can also provide a depth register. Sleeve 10 is intended to be positioned below the point at which the installation of the multilateral junction is desired or has been created. By the engagement of the tool with

orientation profile 20, an operator at the surface can direct the drilling of a lateral wellbore into a gas and oil formation or re-entry thereto with great precision.

[0024] While preferred embodiments have been shown and described, various modifications and substitutions may be made thereto without departing from the spirit and scope of the invention. Accordingly, it is to be understood that the present invention has been described by way of illustration and not limitation.